

WHAT IS CLAIMED IS:

1. A semiconductor memory device having a gate insulation film, comprising:
 - a semiconductor substrate;
 - a memory cell array formed on the semiconductor substrate, the memory cell array including a plurality of memory cell transistors, each of which has the gate insulation film;
 - a first interlayer insulation film covered the memory cell array and including deuterium;
 - a silicon nitride layer formed above the first interlayer insulation film; and
 - a second interlayer insulation film formed above the silicon nitride layer, and including deuterium, a density of deuterium in the first interlayer insulation film being higher than that of deuterium in the second interlayer insulation film.
2. The semiconductor memory device having a gate insulation film according to claim 1, the gate insulation film is a tunnel oxide film.
3. The semiconductor memory device having a gate insulation film according to claim 1, further comprising a conductive line formed on the second interlayer insulation film.
4. The semiconductor memory device having a gate insulation film according to claim 1, the semiconductor memory device is a nonvolatile memory device.
5. The semiconductor memory device having a gate insulation film according to claim 1, the semiconductor memory device includes one of a NAND type, an AND type, a NOR type, and a DINOR types of a nonvolatile memory device.
6. A memory card including the semiconductor memory device recited in claim 1.
7. A card holder to which the memory card recited in claim 6 is inserted.
8. A connecting device to which the memory card recited in claim 6 is inserted.
9. The connecting device according to the claim 8, the connecting device is configured to be connected to a computer.

10. A memory card including the semiconductor memory device recited in claim 1 and a controller which controls the semiconductor memory device.

11. A card holder to which the memory card recited in claim 10 is inserted.

12. A connecting device to which the memory card recited in claim 10 is inserted.

13. The connecting device according to the claim 12, the connecting device is configured to be connected to a computer.

14. An IC card on which an IC chip that includes the semiconductor memory device recited in claim 1 is located.

15. A semiconductor memory device having a gate insulation film, comprising:

- a semiconductor substrate;

- a memory cell array formed on the semiconductor substrate, the memory cell array including a plurality of memory cell transistors, each of which has the gate insulation film, a floating gate formed on the gate insulating film, a control gate adjacent to the floating gate;

- a first interlayer insulation film covered the memory cell array and including deuterium;

- a silicon nitride layer formed above the first interlayer insulation film;

- a second interlayer insulation film formed above the silicon nitride layer, and including deuterium, a density of deuterium in the first interlayer insulation film being higher than that of deuterium in the second interlayer insulation film; and

- a bit line formed above the second interlayer insulation film.

16. The semiconductor memory device having a gate insulation film according to claim 15, the gate insulation film is a tunnel oxide film.

17. The semiconductor memory device having a gate insulation film according to claim 15, further comprising a conductive line formed on the second interlayer insulation film.

18. The semiconductor memory device having a gate insulation film according to claim 15, the semiconductor memory device is a nonvolatile memory device.

19. A memory card including the semiconductor memory device recited in claim 15.

20. A card holder to which the memory card recited in claim 19 is inserted.
21. A connecting device to which the memory card recited in claim 19 is inserted.
22. The connecting device according to the claim 21, the connecting device is configured to be connected to a computer.
23. A memory card including the semiconductor memory device recited in claim 15 and a controller which controls the semiconductor memory device.
24. A card holder to which the memory card recited in claim 23 is inserted.
25. A connecting device to which the memory card recited in claim 23 is inserted.
26. The connecting device according to the claim 25, the connecting device is configured to be connected to a computer.
27. An IC card on which an IC chip that includes the semiconductor memory device recited in claim 15 is located.
28. The semiconductor memory device having a gate insulation film according to claim 15, the semiconductor memory device includes one of a NAND type, an AND type, a NOR type, a DINOR types of a nonvolatile memory device.
29. A method of manufacturing a semiconductor memory device having a gate insulation film, comprising;
- forming a memory cell array on a semiconductor substrate, the memory cell array including a plurality of memory cell transistors;
- forming a silicon nitride layer so as to cover the memory cell array including a plurality of memory cell transistors;
- annealing with an oxidation atmosphere the semiconductor substrate on which the memory cell are formed and above which the silicon nitride layer are formed; and
- annealing with a deuterium atmosphere the semiconductor substrate on which the memory cell are formed and above which the silicon nitride layer are formed.

30. The method of manufacturing a semiconductor memory device having a gate insulation film according to the claim 29, the oxidation atmosphere is one of vapor atmosphere, and mixture atmosphere of hydrogen and oxygen.

31. The method of manufacturing a semiconductor memory device having a gate insulation film according to the claim 29, further comprising, forming a first insulation film above the memory cell array before the annealing with the oxidation atmosphere.

32. The method of manufacturing a semiconductor memory device having a gate insulation film according to the claim 29, further comprising, forming a second insulation film above the memory cell array after the annealing with a deuterium atmosphere.

33. The method of manufacturing a semiconductor memory device having a gate insulation film according to the claim 29, further comprising, forming a bit line above the memory cell array.